# A PUZZLING POLYPODIUM ON THE PORT HILLS

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Though our New Zealand species of Grammitis and Phymatosorus were both once included in Polypodium (e.g. Cheeseman, 1925) no native species is now attributed to this genus, which is nowadays interpreted in a much more restricted sense.

To the best of my knowledge Polypodium sensu stricto was first discovered in New Zealand by Yvonne Elder and John Thompson, who saw it in a wall just outside the bottom of the Lyttelton Reserve approximately ten years ago, sometime between 1966 and 1973. It still persists in this locality, but has increased but little, being evidently not happy in this situation. In July 1980 six plants were present, but all were juvenile or submature, with only a single partially sporangiferous frond present in the whole population. It seems unlikely, in view of much larger colonies in Breeze Bay (see below), that this is the original site of introduction, although the possibility of an ultimate origin for Polypodium on the Port Hills by escape from a Lyttelton garden cannot be discounted.

In the Breeze Bay locality, where it was first discovered by Laurie Metcalf in June 1976, there are a number of clumps of varying size on smaller rock outcrops well above the main crags, but the largest colonies are at the bottom of very steep grassy slopes immediately above a vertical rock-face, in practice accessible only to those who are tired of life! The size of these colonies suggests that they may have been present there for a considerable time. The full extent of the population is difficult to determine even with binoculars, because of numerous colonies of Asplenium oblongifolium (= lucidum*), variable in luxuriance, occupying similar sites along the cliff.

Until May 1980, only a single clump was known on Mt. Cavendish, well above the road. This clump has probably increased since first discovered by Toni Huber in December 1977. In May 1980 three tiny sporelings were detected not far away, while search on rocks and retaining walls below the road resulted in six more mature plants being detected. The occurrence of Polypodium on Mt. Cavendish straddles the famous station for Pleurosorus rutaefolius, and indeed one plant of Polypodium grows within a few inches of an example of Pleurosorus. The Polypodium is thus capable of colonising the hottest and driest north-facing rocks on the Port Hills. During the hottest months of the year, at least in dry summers, it very probably persists here solely through its fleshy rhizome, the fronds withering. This opinion is supported by our inability to refind the known colony on Mt. Cavendish in Mid-February, even though its exact site was correctly located. This locality on Mt. Cavendish thus presents a dramatic contrast to the damp south-facing rocks above Breeze Bay and demonstrates that this fern has a very wide range of ecological tolerance on the Port Hills.

N.B. * Asplenium oblongifolium Colenso = A. lucidum Forst.f. (1786), non A. lucidum Burman (1768). See Brownsey, P.J., N.Z.J. Bot. (1979), 17 : 217-8.

The most recently discovered site, found by Martin Daellenbach and myself in February 1980 on grassy roadside rocks between Jollie's Bush and Evans' Pass, is of limited extent, (30 metres) but includes one patch of substantial size (100+ fronds) and several smaller clumps. Nevertheless, it is likely that both this locality and that on Mt. Cavendish are of quite recent establishment. It is difficult to believe that such a distinctive fern would have gone unnoticed by earlier pteridologists, growing so close to the main station for Pleurosorus rutaefolius in the Christchurch district.

The true identity of this adventive polypody constitutes something of a problem. It is well-established (Manton, 1950, Ch. 8; Shivas, 1961; see Briggs & Walters, 1969, pp. 210-215, for a more accessible summary) that in Britain and western Europe three biological species exist within the Polypodium vulgare aggregate, namely P. australe Fée, P. vulgare L. and P. interjectum Shivas. These constitute an ascending polyploid series, being respectively diploid, tetraploid and hexaploid in chromosome number. The cytogenetic relationship of the three species, which can be represented as CC, AABB and AABBCC, is curious, since although the hexaploid, P. interjectum, is derived by allopolyploidy from the other two species, P. australe and P. vulgare, these are themselves unrelated (except inasmuch as they belong to the same genus). That these are three distinct species is thus not in doubt.

Both the macro- and micro-morphology of this complex have been intensively studied (e.g. Manton, loc. cit.; Shivas, loc. cit. & 1962; Roberts, 1970:). My first reaction on examining the macromorphology of a plant in cultivation at Lincoln and of plants growing on the Port Hills was to have little doubt that the species present here was Polypodium interjectum, on account of its oval sori, frond shape, inflexed lower pinnae and autumnal growth (cf. Shivas, 1962; Clapham, Tutin & Warburg, 1962; Hyde, Wade & Harrison, 1969), though a minority of fronds, particularly some from Mt. Cavendish, more nearly resemble P. vulgare in sorus (round) and frond shape (parallel-sided). However, examination of micro-characters, which are more certainly diagnostic, (number of cells in the sporangium annulus, and number of cells separating annulus from sporangium stalk) indicates that the Port Hills plants are in fact P. vulgare sensu stricto, an opinion reinforced for two collections by determination of a tetraploid chromosome number.

The atypical macro-morphology remains a problem, though since it is common to all sites it does suggest that all our known localities originate from a single initial introduction. Material has been sent to the British Museum for expert opinion. It is most probable that we have present around Christchurch an atypical form of Polypodium vulgare L., but at present it remains possible that our plants have not originated from Europe.

Meantime it seems worthwhile to draw the attention of pteridologically-minded botanists to the existence of this plant locally, particularly since it is possible that it is presently rapidly extending its range and may well already be present in many more localities in the Port Hills than those yet detected. Already its known localities extend over three miles. Any more records will be gratefully received. It can be mistaken only for

a poorly grown example of Phymatosorus diversifolius, but the fronds are pinnate, not pinnatifid, always much less coriaceous, and of a lighter green, with a matt, not shiny, upper (adaxial) surface.

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